



**U.S. Department of  
Transportation**

Office of the Secretary  
of Transportation

Office of Inspector General

# Memorandum

Subject: INFORMATION: Wide Area Augmentation  
System, AV-1998-189

Date: August 10, 1998

From:   
 Kenneth M. Mead  
Inspector General

Reply to  
Attn of:

To: Federal Aviation Administrator

This memorandum provides additional information resulting from our continuing review of the Federal Aviation Administration's (FAA) Wide Area Augmentation System (WAAS) Program. On April 15, 1998, we issued a letter summarizing our review of WAAS to Congressman Frank R. Wolf and on May 13, 1998, we incorporated that letter in a report addressed to you. We noted that in our opinion a back-up system for WAAS would be needed for the foreseeable future, and that determining whether WAAS would be a sole or primary means of navigation is the most critical issue impacting the WAAS Program. Since then, FAA has accepted delivery of all Phase I WAAS reference stations and is sponsoring an independent risk assessment of the vulnerability of the Global Positioning System (GPS) and augmented GPS.

We have four additional observations. First, congressional report language for the Department of Transportation Fiscal Year (FY) 1999 appropriations limits financial commitments for the WAAS Program. Second, FAA should formally acknowledge that its current schedule for operation of the final phase of WAAS (December 2001) will not be met and a more realistic schedule should be established. Third, FAA should delay commitments for additional communications satellites until operating experience with the initial phase of WAAS is gained and key issues impacting the program are resolved. Fourth, FAA should revise its decommissioning schedule for existing ground based navigation systems, scheduled to begin in 2005, to ensure adequate operational experience with the final phase of WAAS is obtained.

### Congressional Appropriations

Congressional appropriations language for FY 1999 limits financial commitments for the WAAS Program. U.S. Senate Bill S. 2307, (Report Number 105-249) which was passed on July 24, 1998, restricts the use of funds for WAAS until certification by the Secretary and you that (1) WAAS is a sole means of navigation, (2) signal continuity issues have been solved, and (3) the WAAS cost benefit ratio exceeds that of other landing and navigation aids. Similarly, U.S. House of Representatives Bill H.R. 4328 (Report Number 105-648), passed on July 30, 1998, restricts use of funds for satellites for WAAS until you certify that a lease versus buy analysis has been conducted indicating the leasing of satellites is the lowest cost to the Agency.

Results of the ongoing assessment of augmented GPS (WAAS) as a sole means of navigation are not expected to be finalized until January 1999. Based on discussions with the WAAS Program Office, funding will be available to sustain the program through October 1998. If the House and Senate conferees adopt the current appropriations language restricting WAAS funding, continued development of WAAS will likely be suspended.

### WAAS Schedule

The current official schedule for the final phase of WAAS will not be met and a more realistic target date should be established. According to the February 11, 1998 report to Congress on the status of the WAAS Program, initial WAAS (Phase I) will be operational in late 1999 and the final phase will be operational in December 2001. The key to having a fully operational WAAS by the end of 2001 is obtaining the additional communications satellites. However, a solution for obtaining the communications satellites by the planned final operational capability date has not been identified.

FAA issued a request for information in January 1998 to solicit industry's capability to provide satellite services for WAAS. Based on the responses to this request, the program office concluded that industry could not develop a satellite solution to meet the December 2001 date for the final phase of WAAS. These satellites are vital to meeting the performance requirements of the final phase of WAAS because they will provide the required coverage over the continental United States. It may take as long as 3 to 7 years to get the additional satellites operational if new satellites have to be launched, tested, and tuned. Consequently, FAA should establish a more realistic target date for the final phase of WAAS.

### Satellite Commitments

FAA should defer any commitments for additional communications satellites until it obtains operational experience with Phase I WAAS and key issues impacting the program are resolved. This will ensure the satellite decision reflects experience gained from the use of the Phase I system and will also ensure the satellites chosen will be fully capable of providing the required service. FAA is currently analyzing various options to address interim and long-term solutions to satisfy its WAAS communications satellite requirements. For example, the WAAS Program Office is investigating the possibility of obtaining additional satellites from its existing satellite provider. FAA is expected to finalize its strategy later this year. Program uncertainties we previously reported dealing with unintentional and intentional interference and ionospheric distortions are also being addressed.

By obtaining operational experience with WAAS, FAA will have the opportunity to evaluate the performance of WAAS, to further assess its vulnerability to interference, and to gauge the significance of ionospheric distortions. The additional information gained during this time may be influential in finalizing the exact number of communications satellites needed, their location, or other required performance characteristics. Further, FAA acknowledges concern that lightweight battery-powered jammers could interfere with GPS signal reception. There are also concerns regarding the ionospheric impact on WAAS. The next peak of ionospheric activity, expected in 2001, may affect the GPS and WAAS signals and cause temporary loss of satellite navigation or precision approach services.

Decisions regarding additional communications satellites will also be impacted by the frequency selected for a second coded civil GPS signal for aviation use. In March 1998, the Interagency Global Positioning System Executive Board approved the use of a second civil signal for aviation purposes; however, the frequency for this additional signal was not specified. The current WAAS design will have to be modified to use the additional signal and determination of the frequency is scheduled for late August 1998. Similarly, the existing communications satellites cannot accommodate the additional signal. Future communications satellites will have to be configured to use the new signal prior to their launch; however, the new frequency will not be fully available to aviation users until 2007.

### Decommissioning Schedule

FAA's decommissioning schedule should be adjusted to ensure that adequate experience with the final phase of WAAS is gained before decommissioning existing navigational aids. Currently, FAA plans to begin decommissioning

existing ground-based navigation aids such as nondirectional beacon facilities and category I instrument landing systems in 2005. This schedule was developed under the scenario that WAAS would ultimately be the sole means of navigation. It was also based on the implementation date of December 2001 for the final phase of WAAS. The 1996 Federal Radionavigation Plan states that the phaseout of category I instrument landing systems and nondirectional beacons will be completed by 2010. Delays in obtaining a communications satellite solution coupled with ongoing studies regarding the vulnerabilities of GPS further support the need to delay decommissioning existing navigational aids.

On-going analyses sponsored by FAA are addressing the vulnerabilities of GPS. In response to an RTCA recommendation, FAA is funding an independent risk assessment of the vulnerability of the GPS. The study will “determine the ability of GPS and augmented GPS to satisfy the performance requirements to be the only navigation service provided by the FAA. . . .” The assessment, being performed by the Johns Hopkins University Applied Physics Laboratory, is scheduled to be completed by December 1998 and a final report is due in January 1999. The results of this assessment may also impact FAA’s communications satellite decision as it relates to the number and location of communications satellites needed for WAAS.

#### OIG Future Plans

We plan to continue monitoring significant developments impacting FAA’s WAAS Program. If we can answer any questions, please feel free to contact me on (202) 366-1959, or Alexis Stefani, on (202) 366-0500.

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